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A NEW SPECIES OF *HENNEGUYA* (MYXOSPORIDA, PROTOZOA) FROM WEST AFRICAN CATFISH, *CLARIAS LAZERA* VAL., WITH A REVIEW OF THE GENUS *HENNEGUYA* THELOHAN, 1892

M. O. ABOLARIN

A new species of Myxosporida, *Henneguya clariae*, is described from the gills of *Clarias lazera* caught from various waters in Nigeria. Pathogenic effects in the destruction of the components of the branchial system are exhibited. Infections, which were confined to the catfish, were detected in about 25% of *Clarias lazera*.

A review of the genera *Henneguya*, *Myxobilatus*, *Unicauda* and *Neohenneguya* is made and these were synonymised, with some reservations in the case of *Neohenneguya*, to *Henneguya*. A checklist of the genus *Henneguya* is given.

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Little is known of the Protozoa of African fish in general and of Myxosporida in particular. GURLEY (1894), AWERINZEW (1913), FANTHAM (1919a, b; 1930), KUDO (1920), BAKER (1963) and PAPERNA (1968) cover the present knowledge of the Myxosporida of fish in Africa.

As the population inevitably increases, the demand for fish as a source of protein will grow, but Myxosporida, among other parasites, may cause immeasurable damage to the fishing industry as pointed out by GURLEY (1894), DOGIEL et al (1961) and WILLIAMS (1964). The difficulties of getting information from scattered literature on *Henneguya* were expressed by TRIPATHI (1952) and NICHOLAS and JONES (1959).

This paper reports the occurrence and the pathogenic effects of a new species of *Henneguya* in the Nigerian freshwater catfish. It also gives a review and a checklist of the genus.

MATERIALS AND METHODS

Fish were collected by gill-netting and cast-netting from the following places in Nigeria: (a) Samaru Dam, Zaria, North Central State, (b) Galma River Basin, Zaria, (c) Shika Stream, Zaria, (d) River Niger (at Jebba), Kwara State, and (e) a stream at Iwo, Western State. The work was carried out between September 1967 and August 1968.

Examination of each fish was carried out according to the techniques established by CHUBB (1963) bearing in mind the necessity for the fastidious thoroughness required for general protozoological studies as emphasised by MACKINNON and HAWES (1961) and confirmed for fish protozoology by ABOLARIN (1966). Cysts, when found, were measured and smears were made by puncturing them on slides. Temporary preparations of the wet, fresh smears for microscopic examination were made in (i) saline, (ii) glycerol, (iii) glycerol and iodine, (iv) polyvinyl lactophenol, (v) polyvinyl lactophenol with a grain of iodine, and (vi) polyvinyl lactophenol with phenol red. Permanent preparations were stained in (a) Giemsa, (b) Giemsa-colophonium, (c) Mayer's haemalum, (d) Best's carmine, (e) Erhlich's haematoxylin, and (f) iron haematoxylin using iron alum in 70% alcohol as mordant. Sections made from cysts fixed in formol acetic acid (F.A.A.) and embedded in paraffin wax were treated as for permanent smears after the cysts had been cleared in clove oil overnight. Measurement of spores from temporary lactophenol preparations as well as from permanent ones mounted in Green Euparal were made with the aid of calibrated eye-piece graticules. These spores were randomly selected from different cysts of different fishes from different localities.

The fishes examined included Family Cichildae (240 fish)—*Tilapia zilli* and *T. gallilaea*; Mormyridae (30)—*Gnathonemus senegalensis*; Cyprinidae (18)—*Labeo senegalensis* and *L. coubie*; Exotic European carps (5)—*Cyprinus carpio;* Lepidosirenidae (1)—*Protopterus annectens*; Polyperidae (25)—*Polypterus senegalensis;* Mochocidae (9)—*Synodontis* spp; Centropomidae (3)—*Lates niloticus*; Malapteruridae (2)—*Malapterurus electricus*; Schilbeidae (1)—*Schilbe* sp; and Claridae (76)—*Clarias lazera*. The identification of the fishes was based on IRVINE (1947), DAGET (1962), DAGET and ILTIS (1965), WHITE (1965) and REED *et al* (1967).

These fishes were examined specifically for protozoan parasites. ABOLARIN (1970) gave the account of the trypanosomes and ABOLARIN (1971) narrated the preliminary studies on genera *Myxobolus* Butschli and *Thelohanallus* Kudo. The current account is part of the materials analysed from the Cnidospora collections.

RESULTS

Henneguya clariae sp. nov.

The cysts: The cysts were nearly always found in the primary gill filaments. Occasionally they might be situated on the gill arch, the opercular depressions and the gill rakers. The young cysts were just visible to the unaided eye and measured 0.5-1.0 mm in diameter (Figs. 1 and 2). The old cysts were larger (Fig. 3) and if two adjacent filaments were attached, a bilobed cyst would be formed as shown by Fig. 4. This might be as big as 4 mm or more. Efforts made to specify which of the gills were preferentially infected showed that any gill might be infected but the extremities, the first and fourth, were more often invaded.

The spore: The cysts of this histozoic parasite, when smeared on a slide, were found to contain hundreds of spores. The valves of the eliptical body of a spore enclosed two polar capsules (Fig. 5) which in most cases were of equal lengths but some spores had one of the capsules shorter and fatter than the other. The discharged polar filaments were equal. When temporarily mounted in iodine-polyvinyl lactophenol mixture, the iodinophinous vacuole in the sporoplasm was visible but neither the temporary nor the permanent stained preparations differentiated the nuclei which were assumed to be present. No sutural line or ridge could be detected. The caudal process was often seen in lactophenol preparation, as a single appendage, but the negative staining effect of Heiden-

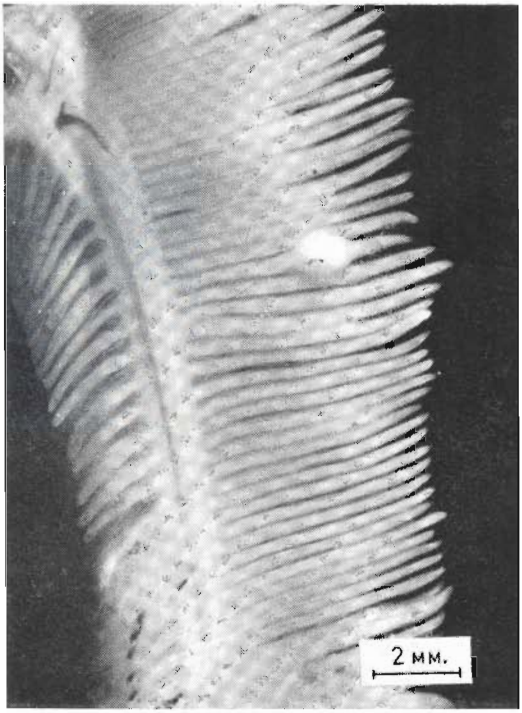

Fig. 1. Very early stage of the cyst shown by one of the primary gill filaments.

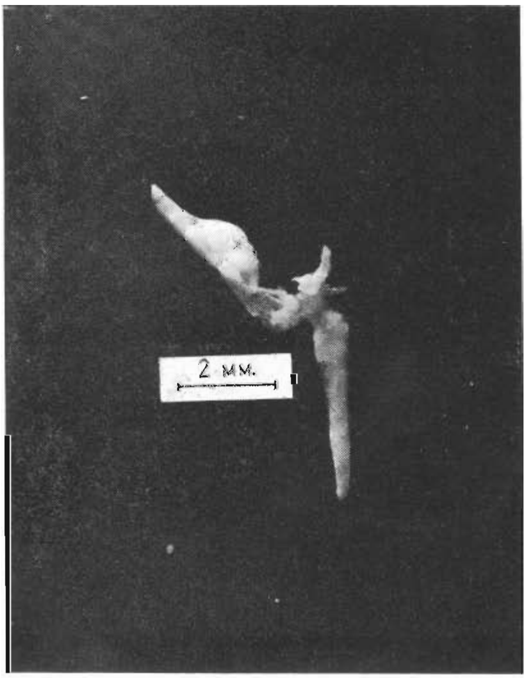

Fig. 2. Early stage. A normal filament being compared with the infected filament.

Fig. 3. One older cyst. Another is removed to show the lesion on the gill.

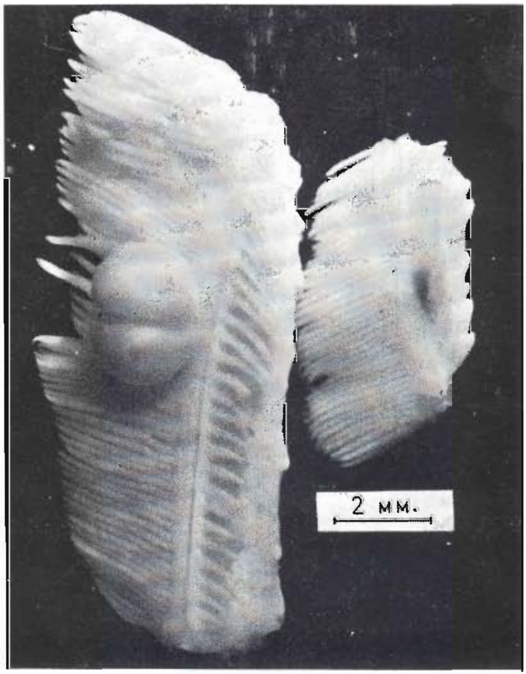

Fig. 4. A bilobed cyst formed by two adjacent filaments attached by the pathogen. The lesion caused by another cyst is shown on the second gill arch shown.

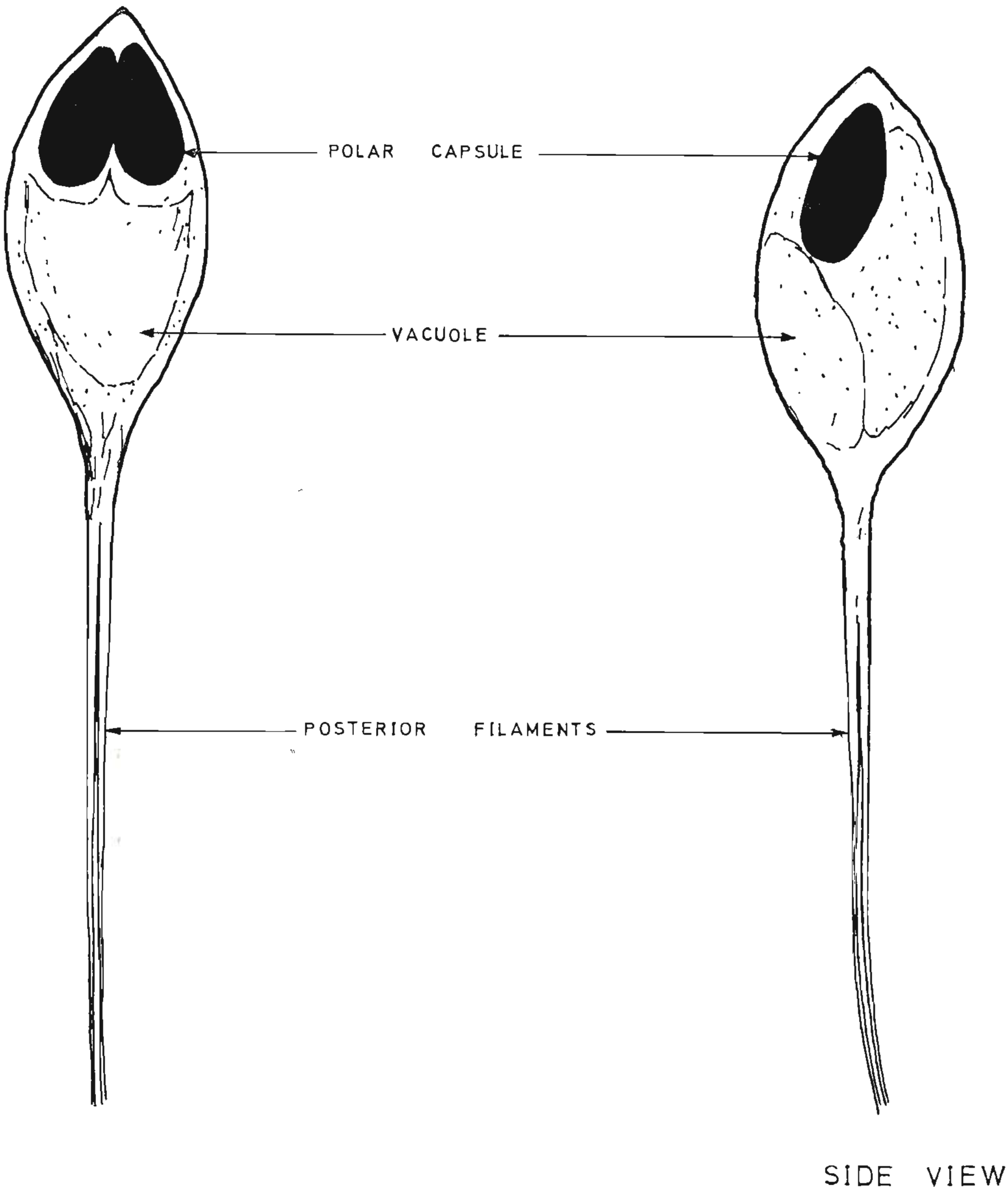

Fig. 5. Diagram showing the spores of *H. clariae.*

hain's iron haematoxylin revealed that this was a bifurcated extension (Fig. 6). Fig. 7 illustrated the Giemsa-stained preparations did not normally show the process but if the Giemsa solution contained some particles, say of dust, the position of the tail was indicated. Ehrlich's haematoxylin faintly stained the spores. Other stains were of little help in the morphological studies. Concentrated sulphuric acid had no effect on the caudal processes. Table 1 shows the measurement of the various components of the spores. Measurements were taken from 55 spores in lactophenol, 10 stained by Giemsa, 7 by iron haematoxylin and 3 by Ehrlich's haematoxylin. There were no appreciable differences in the measurements of these spores from the various media.

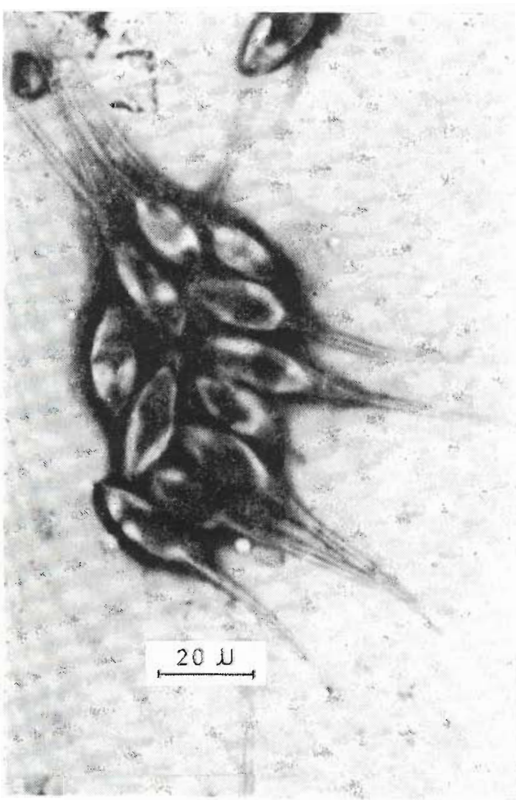

Fig. 6. Spores stained by iron haematoxylin to show the bifurcations that may not be revealed in Giemsa or lactophenol.

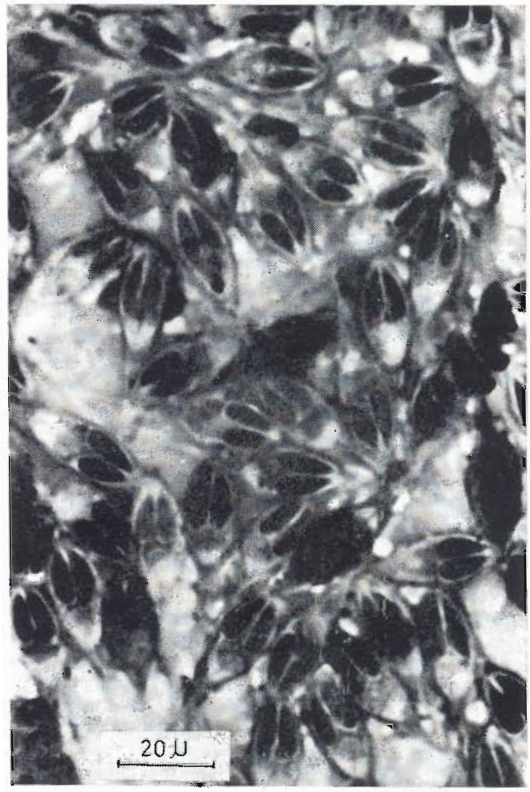

Fig. 7. Giemsa stained spores.

The wide range in measurements such as the total length (45.0-107.5 µ) (for the selected spores at random from different cysts in different hosts) is noteworthy, but the material

Table 1: Measurements of spores in µ.

	Range	*Average*
Length of spore (Nicholas and Jones, 1959)	17.5—28.5	22.0
Breadth of spore	5.5— 8.5	6.5
Thickness of spore	5.5— 7.5	6.0
Length of Longer Polar Capsule	5.5—13.5	11.0
Length of Shorter Polar Capsule	5.0—12.0	
Breadth of Longer (Thinner) Polar Capsule	2.5— 3.0	3.0
Breadth of Shorter (Fatter) Polar Capsule	3.0— 3.5	
Length of Polar Filament	21.0—22.5	22.0
Length of Caudal Process (Nicholas and Jones, 1959)	27.5—89.0	66.0
Total length of Spore	45.0—107.5	88.0

was regarded as only a single species for there were no sharp differences in the distribution. All efforts made with the various staining techniques failed to show the nuclei in the spores.

From the histological sections of the cysts (Fig. 8) the developmental stages of the spores were observed. The cyst wall was formed by host tissue, inside which could be seen multinucleate trophozoites. Inside these were tailless spores and nearer the centre of the cyst were the more advanced but still immature long-tailed spores. These slender-looking spores had longer tails than the fully mature spores shown in Fig. 7, which were commonly found to fill the old cyst. The average length of the appendages of the immature spores was 70 μ while that of the mature spores was 66 μ. The development of the sporont appeared to be disporoblastic producing pansporoblasts. This conclusion was based upon the observation of some developing spores which could be placed in a series, varying from those joined by a common tail with two "heads" tail-to-tail to those with tails clearly separated.

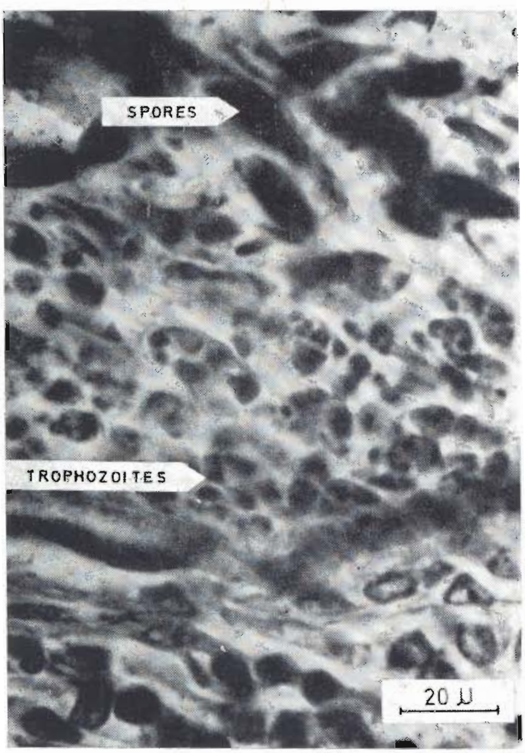

Fig. 8. Enlarged portion of a section of a cyst showing the development stages. Topmost shows the young spores, followed by the multinucleate trophozoites before the cyst wall.

Diagnosis

Host: Clarias lazera Val., 1840

Habitat: Gills of *Clarias lazera*

Localities: (a) River Niger (Jebba), (b) Samaru Dam (Zaria), (c) Shika Stream (Zaria) in Nigeria, West Africa.

Pathology

Infections which were found to be confined to *Clarias lazera* Val. were detected in only 17 fish. The parasite in cysts occurred throughout the year.

Histological sections revealed how the gill cartilage was eroded and the secondary lamellae obliterated during the development and growth of the cyst (Figs. 9 and 10). Lesions left behind by the cyst removed from a gill arch as shown in Fig. 4 confirmed that the branchial vascular system might be impaired as blood vessels were destroyed and circulation reduced. This proved beyond doubt that this species is pathogenic. It may be expected that the percentage of the infected fish in the population would rise above the present 25% per total hosts in these natural habitats when fish are crowded as they are bound to be in the commercial fish farms and aquaria.

DISCUSSION

Appendix A lists the species of *Henneguya* so far described, but certain details of some species as indicated were not available. Among the described species three are considered similar to the present species. The first, *H. strongylura* is the only member of the genus described hitherto from any fish in

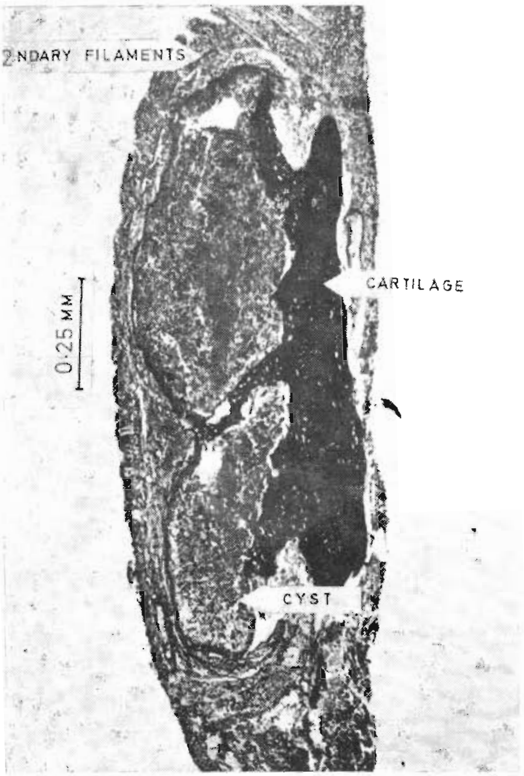

Fig. 9. Longitudinal section of Fig. 2, demonstrating the erosion of cartilage of the gill filament and the obliteration of the secondary filaments which are the seat of respiratory exchange.

Africa. That was from *Synodontis schall* (family Mochocidae) from the Nile. In 1944 DAVIS altered the genus to *Unicauda* on the basis that the caudal process was not bifurcated as would be observed from the published drawings. It could be argued that the controversy about whether the process was bifurcated or not was due to the lack of thorough investigations and appropriate techniques narrated above. Thus, the present parasite could have been *H. strongylura* in accordance with the arguments in the above. However, the conspicuous sutural line of the spore of *H. strongylura* was not seen in the current work and the pathogen under consideration was not detected from any of the *Synodontis* examined. Moreover, the spores of the present species are larger than those of *H. strongylura* and the family host is different.

The second is *H. exillis* Kudo, 1929, from *Ictalurus punctatus,* the North American channel catfish (family Ictaluridae). The similarities are in the dimensions of the cysts and length of spore but, as *H. exillis* occurs in a different continent, it has narrower spores and its cysts are not only found in the gill but also in the integument, therefore it is differentiated from the species from the gills of *Clarias lazera*. The last is *H. lobosa* described by COHN in 1895 from *Esox lucius* and *E. reichertis* in the U.S.S.R. The spore of that species has a general configuration similar to the material dealt with here. But the present organism is different from *H. lobosa* in that the cysts are not branched as reported

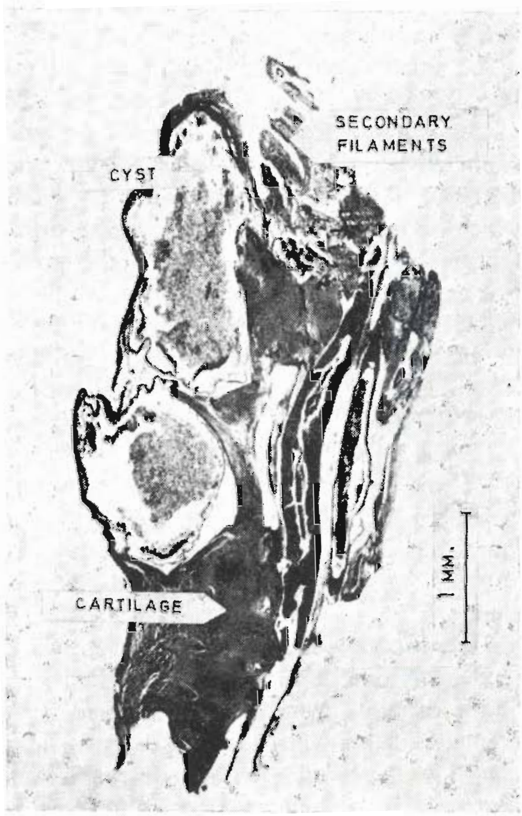

Fig. 10. Transverse section of Fig. 4.

for *H. lobosa* and studies of the measurements show that the spores of the species here are longer. Therefore, it is evident that the present species has not been described previously and because of its common occurrence in a species of *Clarias* it is proposed to name it *Henneguya clariae* sp. nov.

A REVIEW OF THE GENUS *HENNEGUYA*

THELOHAN created the genus in 1892. In 1944 DAVIS split it into two genera. He retained *Henneguya* for those species that showed bifurcated caudal appendages and called those in which no bifurcation of the posterior elongation was detected *Unicauda*. In addition to these two genera with similar features he established a new genus in the same year and named this *Myxobilatus*. *Myxobilatus* was identified by the asymmetrical valves and the two polar capsules supposed to be situated on both sides of the sutural line. TRIPATHI (1949), unaware of the earlier work of Davis, still referred to both *Henneguya* and *Unicauda* as *Henneguya*. TRIPATHI (1952) erected another genus which he called *Neohenneguya*. He reported that paired appendages occurred at the posterior as well as anterior ends.

KUDO (1966) discounted *Myxobilatus* on the basis that the detection of the sutural line is exceedingly difficult. The classical works by BYKHOVSKAYA-PAVLOVSKAYA et al (1964), DOGIEL (1965) and SHUL'MAN (1966) did not record a single species of *Unicauda*. In fact, SHUL'MAN (1966) implied that *Unicauda* is a synonym of *Henneguya* although no reason was advanced for this view.

The observations made in the current work render any criterion based on the bifurcation of the caudal appendage futile. It had been pointed out that while the caudal process did not show the bifurcation in iodine, this was unmistakenly demonstrated in iron haematoxylin. DAVIS (1944) interpreted the observation of WARD (1919) and GURLEY (1893) to mean that the process of *Unicauda* was not stained by Giemsa and that it dissolved away in concentrated sulphuric acid and therefore differed from the spore proper in chemical composition. The current observation showed that the process did not stain normally in Giemsa yet it was not dissolved by concentrated sulphuric acid. Therefore, *Henneguya* and *Unicauda* should be synonymised to the original genus *Henneguya*. The author also agrees with KUDO (1966) that *Myxobilatus* should be a synonym of *Henneguya* because, as Kudo rightly puts it, "the detection of the sutural line is exceedingly difficult".

The difficulty lies with *Neohenneguya*. While one is tempted to accept the description as valid in the absence of the actual material, there is the possibility that the anteriorly drawn, but certainly shorter, projections could have been the extruded polar filaments. Even if these were another set of appendages, they might be simply the result of environmental adaptation or variation warranting the creation of a new species but not another genus.

SUMMARY

Henneguya clariae sp. nov., from the gills of *Clarias lazera* in Nigeria, is described and its pathogenicity depicted with illustrations. A comprehensive review of the genera *Henneguya*, *Myxobilatus*, *Unicauda* and *Neohenneguya* is made with a proposal to synonymise these genera to *Henneguya* Thelohan, 1892. A checklist of the genera and its synonyms is included.

RÉSUMÉ

Le protozoaire parasite, *Henneguya clariae* sp. nov., des branchies du *Clarias lazera* au Nigéria, est décrit et sa pathogénicité présentée avec illustrations. Une révision de l'ensemble des genres *Henneguya, Myxobilatus, Unicauda* et *Neohenneguya* est faite dans le but de synonymiser ces genres au *Henneguya* Thelohan, 1892. Une liste de vérification des genres et de leur synonymes est inclue.

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Appendix A A checklist of the species of Henneguya

SPECIES	AUTHOR	HOST	LOCALITY
1. *Henneguya media*	Thelohan, 1890	*Gasterosteus aculeatus*	France
2. *Henneguya brevis*	Thelohan, 1892	*Gasterosteus aculeatus*	France
3. *Henneguya schizura*	Gurley, 1893	*Esox lucius*	U.S.S.R., U.S.A.
4. *Henneguya creplini*	Gurley, 1894	*Acerina cernua, Perca fluviatilis*	U.S.S.R.
(Synonym *Myxobolus creplini*)	Gurley, 1894	*Esox lucius, Aspra zingel*	
5. *Henneguya zschokkei*	Gurley, 1894	*Coregonus fera, C. Shinzi*	U.S.S.R.
(Syn. *Myxobolus*	Gurley, 1894	*C. hematis*	Germany, U.S.A.
Henneguya kolesnikori	Gurley, 1894	*Coregonus lavaretus*	
Henneguya salminicola)	Ward, 1919	*Oncorhynchus kisutch, O. keta*	Alaska
6. *Henneguya lobosa*	Cohn, 1895	*Esox lucius, Esox reicherti*	U.S.S.R.
(Syn. *Myxobolus lobosus*)	Cohn, 1895		
7. *Henneguya macrura*	(Gurley) Thelohan, 1895	*Hybognathus nuchalis*	U.S.A.
(Syn. *Unicauda macrura*)			
8. *Henneguya psorospermica*	Thelohan, 1895	*Esox lucius, Perca fluviatilis*	France, U.S.S.R.
(Syn. *Henneguya texta*	Cohn, 1894	*Perca fluviatilis*	U.S.S.R.
Henneguya peri-intestinalis)	Cepede, 1906	*Esox lucius*	France, Switzerland, Pavia.
9. *Henneguya minuta*	(Cohn) Labbe, 1899	*Perca fluviatilis*	Lesina
10. *Henneguya oviperda*	(Cohn) Labbe, 1899	*Esox lucius*	Switzerland, Germany, Austria, Upsala.
11. *Henneguya monura*	(Gurley) Labbe, 1899	*Aphredocerus sayanus*	U.S.A.
12. *Henneguya linearis*	(Gurley) Labbe, 1899	*Pimedolus sebae*	South America
13. *Henneguya strongylura* (*Syn. Unicauda strongylura*	(Gurley) Labbe, 1899 Gurley	*Synodontis schall*	Nile
14. *Henneguya* sp.	(Gurley) Labbe, 1899	*Leuciscus rutilus*	—
15. *Henneguya* sp.	(Gurley) Labbe, 1899	*Coregonus fera*	—
16. *Henneguya tenuis*	Vaney ex conte, 1901	*Acerina cornua*	Lyon
17. *Henneguya legeri*	Cepede, 1905	*Cobitis barbatula*	Isere
(Syn. *Myxobilatus legeri*)		(*Nemachilus barbatulus*)	
18. *Henneguya* nusslini	Schuber et Schroder, 1905	*Trutta faria*	Gutach
19. *Henneguya* sp.	Splendore, 1910	—	—
20. *Henneguya* (?) sp.	Nemeczek, 1911	*Abramis abramis*	Komorn, Hungary
21. *Henneguya gasterostei*	Parisi, 1912	*Gasterosteus aculeatus*	Lago Di Garda
(Syn. *Myxobilatus gasterostei*)			
22. *Henneguya neapolitana*	Parisi, 1912	*Box salpa*	Napoli
23. *Henneguya wisconsinensis*	Mavor et Strasser, 1916	*Perca flavescens*	Wisconsin
(Syn. *Myxobilatus wisconsinensis*)			
24. *Henneguya lutzi*	Cunha et Fonseca, 1918	—	Brazil

SPECIES	AUTHOR	HOST	LOCALITY
25. *Henneguya brachyura* (*Unicauda brachyura*)	Ward, 1919	*Notropis anogenus*	Lake Erie
26. *Henneguya australis*	Johnston et Brancoft, 1919	*Pleotrophtes ambiguus*	Australia
27. *Henneguya* sp.	Johnston et Brancroft, 1919	*Nematalosa elongata*	Australia
28. *Henneguya renicola*	Schuurmans Stekhoven, 1920	—	—
29. *Henneguya gurleyi*	Kudo, 1920	*Ameiurus melas*	Iowa
30. *Henneguya mictospora* (Syn. *Myxobilatus mictospora*)	Kudo, 1920	*Lepomis cyanellus*, *L. humilis*, *Mictopterus salmoides*	U.S.A.
31. *Henneguya miyairii*	Kudo, 1920	*Carassius acuratus*	Fukuoka (Nippon)
32. *Henneguya plasmodia* (Syn. *Unicauda plasmodia*)	Davis, 1922	*Ictalurus punctatus*	U.S.A.
33. *Henneguya* sp.	Davis, 1923	*Pomoxis annularis*	U.S.A.
34. *Henneguya salvelini*	Zandt, 1923	*Salmo salvellinus*	Western Germany
35. *Henneguya carassii*	Fujita, 1924	*Carassius vulgaris*	Japan
36. *Henneguya spatulata* (Syn. *Unicauda spatulata*)	Fujita, 1924	*Carassius vulgaris*	Brazil
37. *Henneguya similis*	Zandt, 1924	*Perca fluviatilis*	Western Germany
38. *Henneguya leporini*	Nemeczek, 1926	*Leporinus momyrops*	Brazil
39. *Henneguya occulta*	Nemeczek, 1926	*Lericarina* sp.	Brazil
40. *Henneguya wenyoni*	Pinto, 1928a	*Tetragonopterus* sp.	Brazil
41. *Henneguya iheringi*	Pinto, 1928b	—	Brazil
42. *Henneguya* sp.	Jameson, 1929	*Sebastodes melanopus*	U.S.A.
43. *Henneguya exilis*	Kudo, 1929	*Ictalurus punctatus*	—
44. *Henneguya bergamini*	Guimaraes, 1931	—(Dissertation not available)	—
45. *Henneguya cessarpintoi*	Guimaraes, 1931	" " "	—
46. *Henneguya fonsecai*	Guimaraes, 1931	" " "	—
47. *Henneguya cutanea*	Dogeil & Petrushevskii	*Salmo salar*	U.S.S.R.
48. *Henneguya clavicauda* (Syn. *Unicauda clavicauda*)	Kudo, 1934	*Notropis blenius*	U.S.A.
49. *Crassicauda* (Syn. *Unicauda crassicauda*)	Kudo, 1934	*Compostoma anomalum*	U.S.A.
50. *Henneguya macropod*	Shiba, 1934	*Macropodus chinensis*	—
51. *Henneguya morgurdae*	Fujita, 1936	*Morgurnda obscura*	Japan
52. *Henneguya limatula*	Meglitach, 1937	*Ictalurus furcatus*, *I. melas*	U.S.A.
53. *Henneguya ophiocephali* (Syn. *Unicauda ophiocephali*)	Akmerev, 1938	*Ophiocephalus argus*	U.S.S.R.
54. *Henneguya acuta*	Bond, 1938	*Esox masquinony*	U.S.A.
55. *Henneguya zikawensis*	Sikama, 1938	*Carassius auratus*	China
56. *Henneguya nigris*	Bond, 1938	*Esox masquinongy*, *E. niger*	U.S.A.
57. *Henneguya amiae*	Fantham et al, 1939	*Esox niger*	Canada
58. *Henneguya esocis*	Fantham et al, 1939	*Esox niger*	Canada
59. *Henneguya salmonis*	Fantham et al, 1939	*Salmo salar*	Canada
60. *Henneguya ameiurensis*	Nigrelli & Smith, 1940	*Ictalurus nebulosus*	U.S.A.
61. *Henneguya otolith*	Ganapati, 1941	*Otolithus rubber*, *O. mascularis*	India

Species	Author	Host	Locality
62. *Henneguya ohioensis* (Syn. *Myxobilatus ohioensis*)	Herrick, 1941	*Eupomotis gibbosus*	U.S.A.
63. *Henneguya rupestris*	Herrick, 1941	*Amblophtes rupestris*	U.S.A.
64. *Henneguya exilis*	Rice & Jahn, 1943	*Ictalurus punctatus*	Iowa
65. *Henneguya magna*	Rice & Jahn, 1943	*Roccus chrysops*	Iowa
66. *Henneguya percae*	Fantham & Porter, 1947	*Perca flavescens*	Canada
67. *Henneguya vitiensis*	Laird, 1950	*Leiognathus fasciatus*	Fiji
68. *Henneguya tridentigeri*	Hoshina, 1952	*Acanthogobius flavimanus*	Japan
69. *Henneguya latesis*	Tripathi, 1952	*Lates calcarifer*	India
70. *Henneguya tetradiata* (Syn. *Neohenneguya tetradiata*)	Tripathi, 1952	*Odontamblyopus rubiandus*	India
71. *Henneguya pungitii*	Akhmerov, 1953	*Pungitius pungitius*	U.S.S.R.
72. *Henneguya electrica*	Jakowska & Nigrelli, 1953	*Electrophorus electricus*	S. America
73. *Henneguya visceralis*	Jakowska & Nigrelli, 1953	*Electrophorus electricus*	S. America
74. *Henneguya baicalensis* (Syn. *Myxobilatus baicalensis*)	Dogiel, 1957	*Asprocottus herzensteini*	U.S.S.R.
75. *Henneguya tegidiensis*	Nicholas & Jones, 1959	*Coregonus clupeodes pennati*	U.K.
76. *Henneguya dogiel*	Akhmerov, 1960	*Siniperca chuatsi*	U.S.S.R.
77. *Henneguya vovki*	Akhmerov, 1960	*Ophiocephalus argus*	U.S.S.R.
78. *Henneguya gigas*	Chen, 1960	*Ophiocephalus maculatus*, *Ophiocephalus argus*	China
79. *Henneguya sinensis*	Chen, 1960	*Ophiocephalus maculatus*, *O. argus*	China
80. *Henneguya sinipercase* (Syn. *Myxobilatus sinipercao*)	Dogiel & Akhmerov, 1960	*Siniperca chua-tsi*	U.S.S.R.
81. *Henneguya alexcevi*	Shul'man, 1962	*Percottus glehni*	U.S.S.R.
82. *Henneguya doneci*	Shul'man, 1962	*Hypophthalmichthys molitrix*	
83. *Henneguya pseudorasborae* (Syn. *Myxobilatus pseudorasborae*)	Shul'man, 1962	*Pseudorasbora parva*	U.S.S.R.
84. *Henneguya doori*	Guilford, 1963	*Perca flavescens*	U.S.A.
85. *Henneguya ocellata*	Iversen et Yokel, 1963	*Sciaenops ocoilatus*	—
86. *Henneguya lagodon*	Hall & Iversen, 1963	*Lagon rhomboides*	—
87. *Henneguya basiri* (Syn. *Unicauda basiri*)	Bhatt & Siddiqui, 1964	*Ophiocephalus punctatus*	India
88. *Henneguya zahoori*	Bhatt & Siddiqui, 1964	*Ophiocephalus punctatus*	India
89. *Henneguya heteromorpha*	Diarova, 1966	—	—
90. *Henneguya pinnae*	Schubert, 1967 (?)	—	—

(—Not available to the author),

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62. *Henneguya ohioensis* (Syn. *Myxobilatus ohioensis*)	Herrick, 1941	*Eupomotis gibbosus*	U.S.A.
63. *Henneguya rupestris*	Herrick, 1941	*Amblophtes rupestris*	U.S.A.
64. *Henneguya exilis*	Rice & Jahn, 1943	*Ictalurus punctatus*	Iowa
65. *Henneguya magna*	Rice & Jahn, 1943	*Roccus chrysops*	Iowa
66. *Henneguya percae*	Fantham & Porter, 1947	*Perca flavescens*	Canada
67. *Henneguya vitiensis*	Laird, 1950	*Leiognathus fasciatus*	Fiji
68. *Henneguya tridentigeri*	Hoshina, 1952	*Acanthogobius flavimanus*	Japan
69. *Henneguya latesis*	Tripathi, 1952	*Lates calcarifer*	India
70. *Henneguya tetradiata* (Syn. *Neohenneguya tetradiata*)	Tripathi, 1952	*Odontamblyopus rubiandus*	India
71. *Henneguya pungitii*	Akhmerov, 1953	*Pungitius pungitius*	U.S.S.R.
72. *Henneguya electrica*	Jakowska & Nigrelli, 1953	*Electrophorus electricus*	S. America
73. *Henneguya visceralis*	Jakowska & Nigrelli, 1953	*Electrophorus electricus*	S. America
74. *Henneguya baicalensis* (Syn. *Myxobilatus baicalensis*)	Dogiel, 1957	*Asprocottus herzensteini*	U.S.S.R.
75. *Henneguya tegidiensis*	Nicholas & Jones, 1959	*Coregonus clupeodes pennati*	U.K.
76. *Henneguya dogiel*	Akhmerov, 1960	*Siniperca chuatsi*	U.S.S.R.
77. *Henneguya vovki*	Akhmerov, 1960	*Ophiocephalus argus*	U.S.S.R.
78. *Henneguya gigas*	Chen, 1960	*Ophiocephalus maculatus*, *Ophiocephalus argus*	China
79. *Henneguya sinensis*	Chen, 1960	*Ophiocephalus maculatus*, *O. argus*	China
80. *Henneguya sinipercase* (Syn. *Myxobilatus sinipercao*)	Dogiel & Akhmerov, 1960	*Siniperca chua-tsi*	U.S.S.R.
81. *Henneguya alexcevi*	Shul'man, 1962	*Percottus glehni*	U.S.S.R.
82. *Henneguya doneci*	Shul'man, 1962	*Hypophthalmichthys molitrix*	
83. *Henneguya pseudorasborae* (Syn. *Myxobilatus pseudorasborae*)	Shul'man, 1962	*Pseudorasbora parva*	U.S.S.R.
84. *Henneguya doori*	Guilford, 1963	*Perca flavescens*	U.S.A.
85. *Henneguya ocellata*	Iversen et Yokel, 1963	*Sciaenops ocoilatus*	—
86. *Henneguya lagodon*	Hall & Iversen, 1963	*Lagon rhomboides*	—
87. *Henneguya basiri* (Syn. *Unicauda basiri*)	Bhatt & Siddiqui, 1964	*Ophiocephalus punctatus*	India
88. *Henneguya zahoori*	Bhatt & Siddiqui, 1964	*Ophiocephalus punctatus*	India
89. *Henneguya heteromorpha*	Diarova, 1966	—	—
90. *Henneguya pinnae*	Schubert, 1967 (?)	—	—

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